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Cement Research Institute of India Foundation-stone Laid

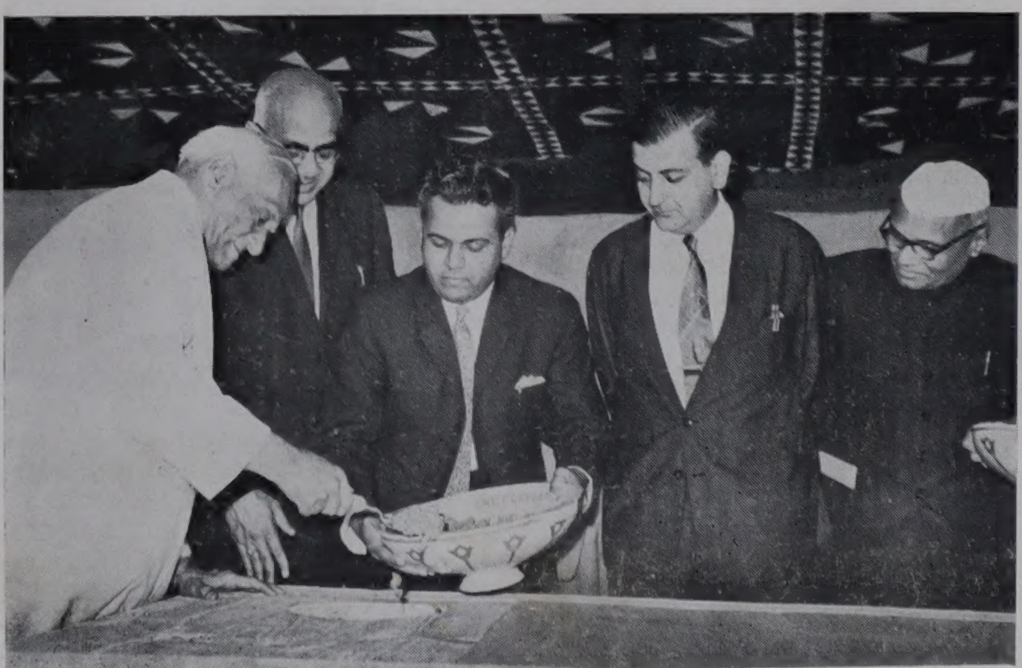
The President of India, Shri V. V. Giri laid the foundation-stone of the buildings of the Cement Research Institute of India (CRI) at Ballabgarh (Haryana) on 25 March 1970. The institute, estimated to cost Rs 1.5 crores in its first phase of development, has been sponsored jointly by the Council of Scientific & Industrial Research, the cement industry and cement user organizations. This is the ninth industrial research association for which CSIR has provided financial assistance. In his address the President said that the idea of having a central research institute to assist the cement manufacturing industry in lowering the cost of production and improving its operational efficiency was commendable. While there were a few cooperative research institutes in the fields of textiles, jute, plywood and tea, the Cement Research Institute of India was perhaps the first example in which all members of the industry and user interests had joined hands with the government.

Underlining the need for achieving a self-reliant economy, the President pleaded for reducing the country's dependence on foreign know-how and aid. He hoped that the cement industry, with the assistance of CRI, would bring about technological improvements not only to reduce the cost of cement but produce better quality cement.

Dr Atma Ram, Director General, Scientific & Industrial Research said that research laboratories could not afford to be mere temples of science. Research laboratories should be intellectual workshops for the regeneration of the nation. The scientists had to act and react constantly with national problems and international knowledge. He added that science could contribute to the economy only through its manifold applications. Basic research was essential to develop scientific capacity but a country could not progress by basic research alone. Describing the research worker as the vital force in a laboratory, Dr Atma Ram appealed to the management to give proper encouragement and support to the research worker. In this context he complimented the management in securing the services of an able and energetic Director, Dr H. C. Visvesvaraya.

Earlier, the President of CRI, Shri V. Podder, said that given proper guidance, the cement manufacture could be established on small as well as medium scale with many advantages such as utilization of small limestone deposits. There were technological and techno-economic problems which both the manufacturers and users of cement had to face. While valuable research work was being done by various private and government laboratories, there was little, 'intensive well-coordinated and planned effort at the national level'. 'It is exactly to fill this gap that the institute has been established', he added.

The President of the Cement Manufacturers' Association, Shri V. H. Dalima said that research would lead to efficient and diversified use of cement and go a long way in meeting the country's special needs, whether for construction of buildings or industrial development. Referring to the present production of cement industry, he said that during the past 55 years cement production had risen from 1000 tonnes in 1914 to 13.6 million tonnes today. A further big leap forward was envisaged in the fourth Five Year Plan which has set the target of production at 18 million tonnes by 1973-74. Despite the great strides being made by the industry, the present per capita cement consumption in the country was one of the lowest in the world, being only about 27 kg as compared



The President of India, Shri V. V. Giri laying the foundation-stone of the buildings of the Cement Research Institute of India at Ballabgarh (Haryana) on 25 March 1970

to 715 kg in Switzerland, 365 in Japan, 343 in USSR and USA, and 305 in UK.

Shri R. M. Khatau, Vice-President of CRI and Chairman of the Research Project Committee referred to the progress made by the cement industry in exporting machinery and technical know-how, and said that with the assistance of CRI, there would be faster development. When fully developed CRI would provide service in analytical and experimental research, testing, technical consultancy, documentation and information and personnel training.

Proposing a vote of thanks, the Director Dr H. C. Visvesvaraya pointed out that the institute has been giving from the beginning close attention to the formulation of research programme. Towards this end every possible attempt has been made to properly identify the problems, the needs of the industry today and a proper technical forecast for tomorrow. With this in view, extensive enquiries were made with the related industries; seminars and discussions were held; and areas of research and specific problems were identified. Having done this, the entire programme has been formulated as a mission-oriented one in which every research project is directed towards fulfilling a specific mission. Another aspect to which considerable attention is being given, he said, is targets and costs in research, which require careful attention as a part of research management in order to get the best out of the investments on research.

As part of the programme, a seminar on 'Cement Industry Operations' was organized on 26 March 1970 at Vigyan Bhavan, New Delhi. In his inaugural address, Shri G. S. Pathak, Vice-President of India, called upon the experts to consider how best this important building material could be utilized. He said that the country was not likely to face cement shortage because of the rapid strides made by the industry.

The institute and its role

The Cement Research Institute of India started functioning with its nucleus office set up in New Delhi towards the end of 1966. The institute was established to strengthen the research effort in the field of cement and concrete technology. Cement industries in almost all the advanced countries have established research institutes, for example the Portland Cement Association's Research Institute at Skokie in USA and the Cement and Concrete Association's Research Institute at Wexhampsprings in UK. The Cement Research Institute of India is a cooperative venture of CSIR, the cement industry and the user organizations. When fully organized the institute will have the following seven divisions: (1) Physics and Chemistry, (2) Cement, (3) Production, (4) Concrete, (5) Cement Structures, (6) Soils and Paving, and (7) Cement and Concrete Standard Reference Service. Effective technical coordination is being established, as the boundaries between the divisions are not rigid. The scope of the research and technical divisions is briefly indicated.

Physics and Chemistry Research Division

Physical and chemical properties of the raw materials used in the manufacture of cement and concrete; development of general laboratory procedures, conventional as well as new ones, for testing for all divisions of the institute including independent research in this field; and petrography, mineralogy, spectroscopy and microscopy including electron microscopy, and X-ray diffraction, infrared and Mossbauer spectroscopy, differential thermal analysis, and thermogravimetric analysis.

Cement Research Division

Studies pertaining to the properties of clinker, cement and cement pastes, studies on hydration and hydration products and of the individual clinker constituents; and development of new cements and cement paints including studies on possibilities of their manufacture and properties.

Production Research Division

Investigations in the field of cement manufacturing technology to increase production, to improve quality and uniformity of cement and to achieve maximum manufacturing economy and efficiency; investigations of processes relating to raw materials, such as quarrying and mining, haulage, crushing, grinding beneficiation, blending and different processes of burning and quenching; investigations of batch mills and furnaces as well as by pilot plants; dry and wet processes; conveying and packing; alkali removal and dust collection; quality and production control; fuels and firing systems; instrumentation, centralized control and automation; and plant maintenance and plant safety.

Concrete Research Division

Concrete materials—concrete mix design; placing and curing methods; strength; deformation and other properties, such as durability, heat resistance, fire resistance of concrete, etc.; cracking; alkali-aggregate reaction; influence of aggressive environment; admixtures and replacements; asbestos cement and asbestos cement products; light and heavy weight concretes; corrosion problems; concrete of specified properties such as non-shrinking, high and low temperature resistant, sound-proof, etc.; ready mixed concrete; and concrete and machinery.

Structural Research Division

Studies on concrete in structures specially through analytical and experimental studies on different structural elements made of plain, reinforced, prestressed concrete and composite constructions and subjected to sustained dynamic or repetitive loads; mass concrete structures. Power structures, dams and canal structures, substructures; development of rational and economical design procedures; model and large scale testing; precasting and prefabrication; use of different materials as reinforcement; and cost and time studies of different methods of construction.

Soils and Paving Research Division

Studies and development of concrete as a paving material; soil cement and its use in road and building constructions, in slope protection of earth dams, in canal linings, etc.; concrete, reinforced concrete and prestressed concrete pavements—their analysis and design; cracking of pavement; joints in pavement slabs including studies on their elimination; and stresses due to differential temperature.

Cement and Concrete Standard Reference Service

The Cement and Concrete Standard Reference Service (CSRS) is available

in the testing of (i) cement, (ii) aggregates, (iii) other concrete materials including pozzolanas, slags and admixtures, and (iv) plain, reinforced or prestressed concrete. Auxiliary services of CSRS division include: (1) providing information on the latest trends in cement and concrete testing followed in other countries; (2) participating in the cooperative test programmes relating to cement and concrete at national and international levels; and (3) rendering advice to members interested in setting up cement and concrete testing laboratories. In addition to the seven divisions, the institute will have two management divisions and two auxiliary technical divisions—Technical Information and Technical Services Divisions. The Technical Information Division will be mainly responsible for the collection, evaluation and dissemination of scientific and technical information. The Technical Services Division will cover procurement and materials management, and workshops.

When fully developed the institute will provide the following services to industry: analytical and experimental research service, testing, technical consultancy, documentation and information, survey data analysis and review, cement and concrte standard reference and personnel service.

From the early stages the institute has formulated its programme of work such that it is industry oriented. Each project in the research programme has a mission so that the results are of immediate use to the cement, concrete and construction industries. The institute took on hand certain projects of immediate importance within the framework of its research programme. The facilities available in organizations like the Indian Institute of Technology, the Hindustan Housing Factory and the Central Water & Power Commission and CSIR laboratories like the National Physical Laboratory, the Central Road Research Institute and the Central Building Research Institute are being made use of to augment the institute's facilities.

Considerable attention has been paid from the beginning to the technical information service of the institute. The institute has established liaison with over hundred organizations, Indian and overseas, through membership or otherwise, for exchanging both publications and technical information. The institute is bringing out a bi-monthly entitled 'CRI Current Contents'—a documentation list of current literature on cement and concrete. It also issues a quarterly, 'CRI Abstracts'. Some *ad hoc* research bulletins and review reports have also been brought out.

Progress during 1968-69

During the year under review ten research projects were in progress.

The 'Cement and Concrete Standard Reference Service' division started supplying 'standard cement' and 'flow table calibration material', which were being imported so far.

A comprehensive review report dealing with the utilization of high magnesia limestones for cement manufacture was brought out. This is of particular significance to the Indian cement industry which has to contend with low grades of limestone as high grade limestones are reserved for chemical and metallurgical industries. Another review deals with the fundamentals of grinding (theories of communition). This review is a step towards improving the grinding efficiency in the case of raw materials and clinker used in cement manufacture and to reduce the cost of grinding.

To provide quick reference to the export-conscious Indian cement industry standard specifications of various grades of Portland cement and its derivatives, the institute brought out 'Cement Standards of the World: A Comparative Summary'.

Investigations on economic mix design of high strength concrete were initiated in collaboration with the Hindustan Housing Factory, New Delhi.

As a first step towards improving nondestructive methods of testing concrete, a comprehensive review report of the methods was prepared.

An investigation was carried out to study the influence of stress on the ultrasonic pulse velocity in concrete for determining the stage of heavy internal cracking that develops in concrete under stress. The results show that the rate of internal cracking and damage due to stress decreases with increase in the strength of concrete.

Studies on the estimation of the true ultimate strength of concrete subjected to uniaxial and multiaxial stress systems were made. The results will be useful in determining the real factor of safety of structures subjected to sustained loading or in specifying suitable safe working stresses for a given factor of safety while designing concrete structures subjected to sustained loading.

Development of Active Carbons at RRL, Hyderabad

Active carbons are black powders, which by virtue of possessing very large surface areas of great irregularity and a variety of chemical groups, are capable of attracting and holding fast to a variety of colouring matters, gases, vapours, etc. Active carbons are used for decolorizing vegetable oils, mineral oils and pharmaceuticals, and for removing undesirable odours from water. They can also be used in gas masks to pick up unpleasant or toxic materials present in the air, or for recovering organic solvents in certain industrial operations by trapping the vapours.

Active carbons can be prepared from any carbonaceous material such as coal, bitumen, lignite or peat or a woody or fibrous vegetable material like coconut shells, rice hulls, certain woods or sawdust, or bagasse. Animal bones can also be used. The first step is to carbonize the raw material to get the coke or char which forms the base for further activation. Such carbonization is generally done out of contact with air at temperatures ranging from 600° to 900°C. The yields depend upon the carbon content of the original material. In carbonizing, the orderly arrangement of the carbon molecules in the material is broken up, and the atoms cluster together in crystallites which grow at the expense of the parent substance. The next step is to create

Raw material preparation. Low temperature carbonization plant is seen in the background

activity on the surface of the char. This is done by subjecting it to the action of oxygen, air or steam, or combinations of these, sometimes in the presence of metal salts. During this operation, functional groups such as hydroxyl, carboxyl, keto, diketo, etc. are created in abundance. At the same time, microchannels, cavities and pores are produced which enormously increase the surface area. A substantial part of the parent material is burnt away, and the final yield of an active carbon may often amount to only 10-30% of the starting carbonaceous raw material.

Active carbons from various raw materials have differing and sometimes specific properties. Some are good for decolorizing, such as those made from carbonaceous materials. Active carbon from bones is unusually effective for decolorizing sugar solutions, though vegetable products are used for this purpose in India. Products made from coconut shell are excellent for gas adsorption and are used in gas masks, while active carbons derived from woods have an unusually low ash content, a necessary condition for decolorizing aqueous pharmaceutical preparations.

Work at RRL, Hyderabad

In view of the growing demand for active carbons in India, studies were started about 1955 by the Regional Research Laboratory (RRL), Hyderabad for the production of carbons using locally available non-coking coal. The work was extended for utilizing (i) other raw materials for the production of active carbons for specialized applications; and (ii) certain waste materials to yield valuable products. The work can be broadly classified into the development and manufacture of active carbons from (i) low grade coal and lignite, and (ii) vegetable raw materials.

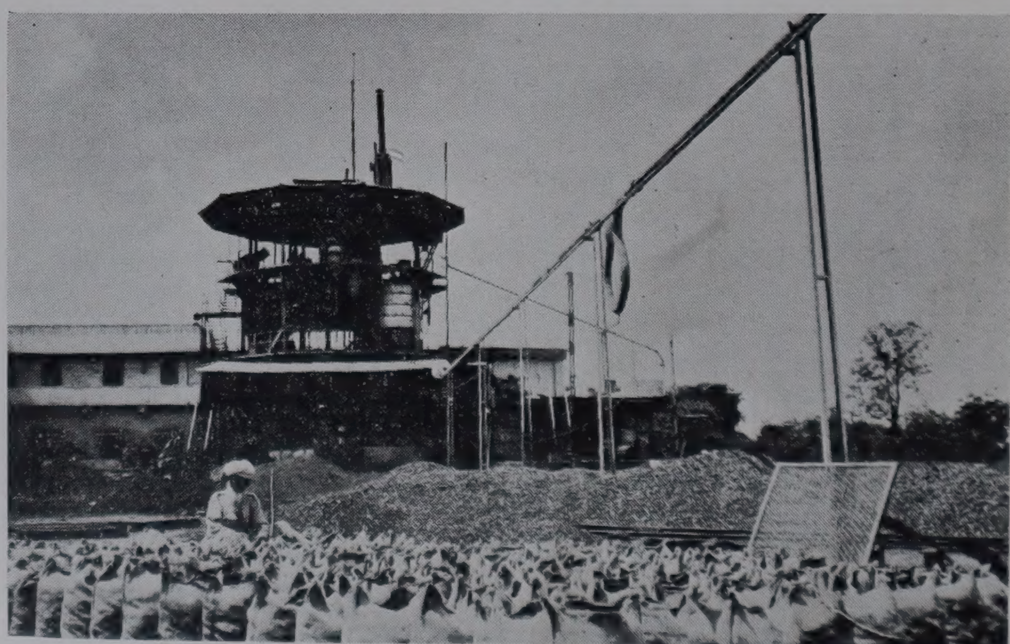
Active carbons from coal and lignite

The preparation of active carbons was yet another step towards the rational utilization of a regional raw material, viz. low grade coal mined at Singareni. The process developed by RRL, Hyderabad consists of two steps: (i) low temperature carbonization of sized coal in an internally heated retort; and (ii) activation of the resultant semi-coke by air, steam or flue gases, alone or in combination.

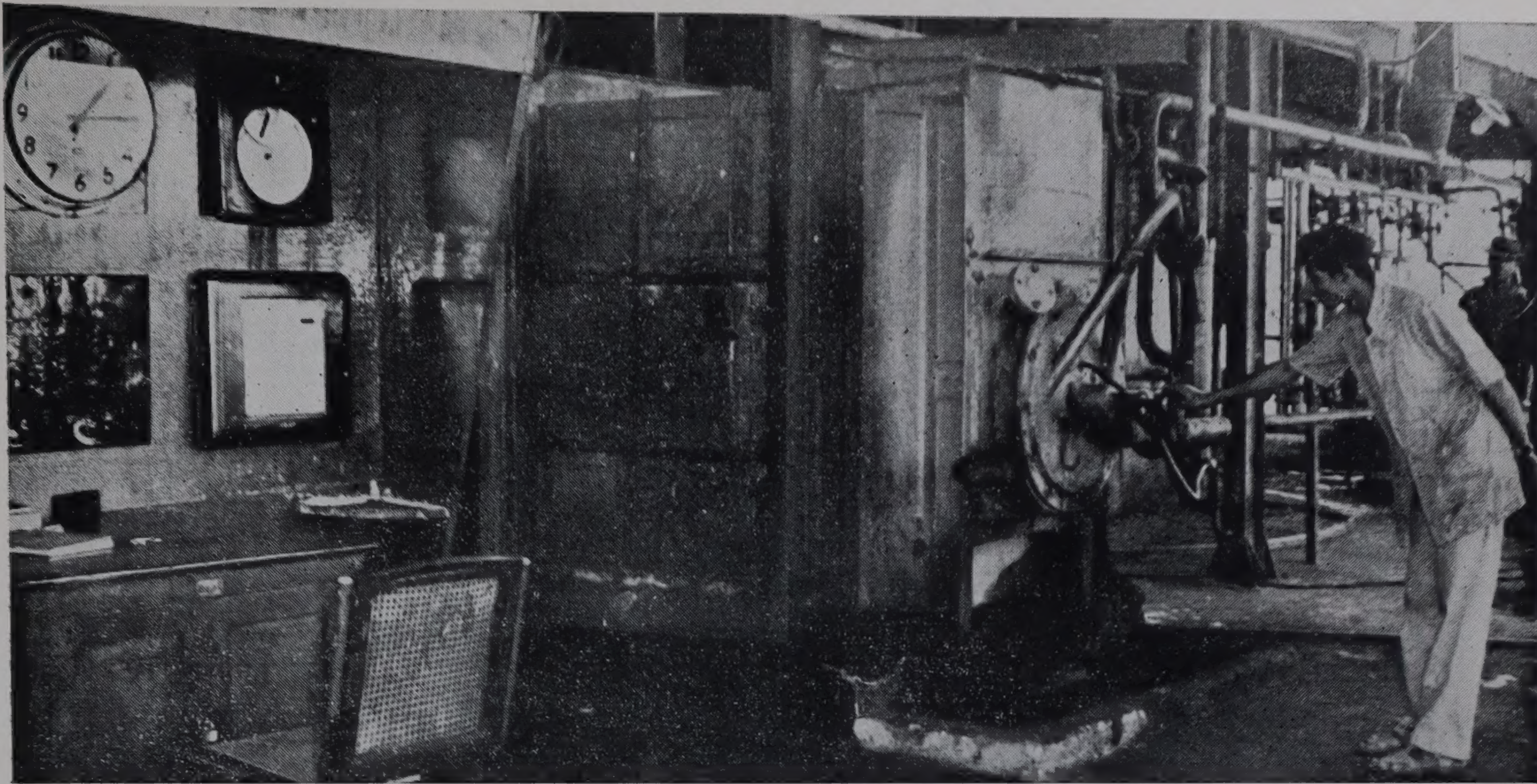
After optimizing the process on a bench scale, a series of pilot scale experiments were carried out in various types of reactors (rotary kiln, fixed-bed and fluidized-bed to optimize the process on a larger scale, collect the techno-economic data for the establishment of larger plants, and study the marketability of the products. Based on the performance of different types of reactors for the activation of semi-coke and low temperature carbonized lignite, the fluidized bed reactor was eventually chosen and a pilot plant with a capacity of 250 kg active carbon per day was set up and put into regular operation. Active carbons of different grades produced on the pilot plant either from Singareni coal or from Neyveli lignite chars have been supplied to various consumers throughout the country under the general trade name, Hykol. The products have found application in the vegetable oil, glucose, chemical and pharmaceutical industries.

Prototype plant

Since the demand for activated carbons was large and mostly met by imports, and since collection of engineering and design data for the establishment of commercial plants seemed desirable, a prototype plant with a capacity of about 2 tonnes of active carbon per day was envisaged; this was supported by the National Research Development Corporation of India. The plant was designed, fabricated and executed by the laboratory. The prototype plant consists of two fluidized-bed reactors each of one tonne capacity. After the desired bed temperature is attained, the char is activated by a combination of air, steam and flue gases for a predetermined residence time. After cooling, the activated product is further upgraded before being



Plant for production of Hykol activated carbons at RRL (Hyderabad) of capacity 2 tonnes/day



Activation is carried out under controlled conditions. Temperature and steam flow recorders are seen on the control panel

packed. The process and technology developed are characterized by efficient heat transfer, a high degree of contact efficiency, a uniform product and efficient economics.

The laboratory has produced and supplied over 1000 tonnes of active carbons valued at about Rs 19 lakhs to meet the requirements of a variety of consumers. Direct import substitution has thus been achieved.

The prototype plant and technology have been sold by the National Research Development Corporation of India to Arcoy Industries, Hyderabad. The plant is in regular commercial operation with an annual turnover of Rs 15-20 lakhs.

Active carbons from vegetable raw materials

Carbons from coal and lignites have certain limitations for specialized application such as gas adsorption and certain types of pharmaceutical processing. These require active carbons of a different nature, which can be prepared from vegetable raw materials. The laboratory is now exploring a variety of potential Indian raw materials, such as pine wood charcoal, rice husk, bagasse and coconut shell, for the preparation of active carbons.

Active carbon prepared from pine wood, for example, has very high adsorption capacity and low ash content. A process for carbonizing pine wood, upgrading byproduct tar and preparing active carbon from the resultant charcoal has been worked out by RRL, Hyderabad. The work has been sponsored by a private party, which is now setting up a plant in Himachal Pradesh with the laboratory's assistance. The plant is expected to produce about 2 tonnes of such active carbon every day.

Active carbon from rice husk

Huge quantities of rice husk obtained during milling of rice are not put to proper use at present. The husk is mostly burnt as fuel, and to some extent compressed into boards. It could be a good source of raw material for the preparation of high quality activated carbon.

In the process now being developed by RRL, Hyderabad the high silica content of the raw material is first reduced and the carbonaceous material is activated. Sodium silicate is a valuable byproduct of the process.

Active carbon prepared from rice husk has been found particularly suitable for the decolorization of pharmaceuticals, since it has a high adsorption capacity and a very low content of soluble matter.

Active carbon from bagasse

Bagasse, a woody residue left after the crushing of the sugarcane, is a waste material of sugar industry. It is presently burnt in boilers to raise steam. Preliminary work done at RRL, Hyderabad shows that a superior quality active carbon can be produced from bagasse. Investigations are under way to develop an economic process.

Active carbon from coconut shell

Coconut shell is an excellent starting material for the preparation of active carbon for use particularly in gas adsorption, solvent recovery and purification of industrial gases. The laboratory has worked out a bench scale process for the manufacture of active carbon from coconut shell. At present the process entails the use of an activating agent; it is being modified so as to eliminate the use of the activating agent.

Conclusion

Until about 1958, the country's total requirement of activated carbons, amounting to about 800 tonnes per

annum, were almost entirely met by imports. The developmental work at RRL, Hyderabad leading to the production on a pilot plant and later on a prototype plant on a limited scale, and the establishment of a few other production units in the country, has completely changed the picture. At present, out of the total estimated annual requirement of about 2000 tonnes, imports are limited to about 250 tonnes. The entire requirements of the vegetable oil and glucose industries are met by indigenous production. The special types of low ash active carbons, which are now being imported by the pharmaceutical industry, can be substituted in the near future by indigenous products, when units based on the know-how developed by the laboratory go into production. The country will thus become entirely self-sufficient in a product which is essential for a number of processing industries. Further outlets for the carbons, e.g. for the purification of potable water, which are yet to be explored in the country are bound to create greater demands for active carbons.

ATIRA'S Seventh Technological Conference

The seventh annual technological conference organized by the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad from 20 to 23 March 1970 departed, as an experimental measure, from the conventional pattern of presenting individual papers covering a wide range of subjects. Held in four technical sessions each devoted to a theme of current industrial interest, the conference addressed itself to the actual applications of ATIRA's research results with regard to cost reduction, quality improvement and productivity increase in member mills. The presentation in each session consisted of initial exposition through a keynote paper of the theme by ATIRA research workers, followed by reports by mill technologists on the practical implications and impact of ATIRA's findings under implementation in the mills. In all, 17 technologists from 11 mills narrated their experience in implementing ATIRA's research results. The first session dealt with the use of linear programming methods in cotton mixing. The keynote paper was presented by A. R. Garde and S. P. Deshpande of ATIRA.

Cotton constitutes the single most important cost element in textile manufacture. Its quality will decisively govern processing efficiency and product quality. Hence, careful selection of cotton to arrive at a judicious balance of economical and technological factors assumes a significant role, more so in the present context of cotton shortage and consequent rise in prices. At present, cotton selectio n is based largely on the expertise of the purchasing authority in quickly and subjectively assessing cotton quality and on the mill's past experience in the processing performance of various cottons.

The techniques of linear programming will help put cotton purchases on a more scientific footing. Linear programming can be a powerful tool in reducing costs without sacrificing efficiency or quality. Large scale trials under industrial conditions have demonstrated the practical feasibility of this method. Substantial savings in cotton cost have been made possible while the processing efficiency and yarn quality have remained unaffected.

The experience gathered by the mills during the implementation of this technique indicates that objective and careful testing of various fibre properties is essential. The technologist will continue to play an important part since his knowledge and experience are indispensable in arriving at the norms for fibre properties of the blend.

The second session was devoted to weaving and the keynote paper on the use of staggering tappets for increasing weaving productivity was presented by C. G. Venkataraman and M. C. Paliwal (ATIRA).

Labour and machine productivity in weaving are low in Indian mills, mainly because of excessive warp yarn breaks resulting from the abrasion and tension during the up and down movement of the threads. The association has developed a staggering tappet which minimizes the inter-thread abrasion and hence reduces breakages. The staggering tappets will be especially beneficial in the weaving of dense fabrics.

The value of the staggering tappets has been confirmed by mill trials. Reduction in warp breakages of the order of 30% and an average increase in production by 2-4% have been observed by mills employing these tappets. ATIRA has also developed suitable gauges for accurate and quick setting of looms so that mills can get maximum and consistent benefits from this development.

The possibilities of cost reduction in dyeing featured in the third session in which the keynote paper was presented by S. S. Trivedi, R. C. Shaw and S. V. Gokhale (ATIRA). As a part of its consultation services to member mills, ATIRA conducts technical surveys of various production departments in mills. The extensive information and experience gathered in the course of several such surveys have enabled ATIRA to formulate various methods of cost reduction in the dyeing department.

Many of the practices currently followed in the mills permit improvement in the interest of cost reduction. Machine productivity in the dyeing department is also generally low and can be improved by better machine maintenance, standardizing dyeing conditions, better training of workers, and better planning of the processing sequence.

ATIRA's scientists have evaluated several methods of minimizing the above problems and lowering dyeing costs. Better and more rational dyeing methods have been suggested. These recommendations have been largely implemented in many mills. Technologists from some of these mills reported detailed data of the savings in cost accomplished by them by introducing the changes recommended by ATIRA.

The fourth and final session highlighted 'Heat economy in textile mills'. Three papers were presented by ATIRA staff on the following topics: Cost of steam in textile industry (K. Subrahmanyam and C. Janakan); Design of textile processing machinery for heat economy (M. Ratna Prabhu); and Process design of caustic soda recovery evaporator (B. I. Bhatt and K. Subrahmanyam).

The cost of generating steam, the main source of heat in textile mills, is rarely computed in normal practice. Systematic studies by ATIRA have yielded a wealth of useful information in this field. Fuel costs account for the bulk of steam generation costs. Natural gas, if available, appears to be by far the cheapest fuel. Expected savings in fuel cost through the use of natural gas will be of the order of 45%. The possibility of heat economy through improved design of machines by incorporating heat economy as one of the criteria in designing textile processing machinery was discussed. Finally, the method of economy-based engineering design for caustic soda evaporators was highlighted, which involves the evolution of engineering design specifications on the basis of optimization of total cost.

These suggestions for heat economy have been well received in the industry and several mills have introduced measures to cut down costs of steam generation as well as to improve efficiency in utilizing steam.

Non-ferrous Metals Technology Symposium Proceedings Volume

The procedings of the symposium on 'Recent developments in non-ferrous metals technology', organized by the National Metallurgical Laboratory (NML), Jamshedpur in December 1968, are being published by the laboratory in three volumes. The first volume, published recently covers aluminium. The second and third volumes will cover (i) copper and nickel; and (ii) lead, zinc and other non-ferrous metals respectively.

The volume under review contains, besides the addresses at the inaugural session, 24 technical papers —research and review as well as informative articles—besides discussions on these. Author and subject indexes are also provided in the 202-page (demy 4to) volume.

The first technical paper by T. Banerjee (NML) summarizes the research and development work on non-ferrous minerals, metals and alloys, carried out at NML.

Studies on the utilization of indigenous raw materials required for metallurgical industries form one of the major activities of NML. In a paper entitled 'Extraction characteristics of alumina from Gujarat bauxite', M. S. Mahanty *et al.* of NML have shown that it is possible to extract 90-92% Al_2O_3 from most of the samples by digesting—10 mesh ore with caustic soda (conc., 200g/litre) under boiling conditions at atmospheric pressure. On the basis of the findings the establishment of an aluminium industry in Gujarat has been advocated.

Studies on the beneficiation of bauxite deposits (7% silica) mined at Lohardaga are described by S. S. Prasad and S. B. Rao of the Indian Aluminium Co. Ltd. A scheme for beneficiation by dry screening the crushed bauxite is described, and factors affecting the economics of beneficiation are discussed. Discussions on the paper revealed that the beneficiation process is recommended as a means of reducing caustic soda costs by reducing the silica content in the beneficiated bauxite.

The development of an improved aluminium conductor from the indigenous electric grade aluminium through heat treatment is discussed by Rajendra Kumar and Manjit Singh of NML. The conductor, designated PM-2, possesses better electrical conductivity, higher strength and improved corrosion resistance. Successful trials on rolling and wire drawing have been conducted on semi-industrial scale at the Indian Cable Co., Jamshedpur.

One of the papers of fundamental nature (by Norbert Samek, Unesco expert, CSIO, Chandigarh) describes a new method for testing liquid and solidification of non-ferrous metals. The structural changes which take place in important aluminium base alloys and their effect on properties of technological importance are presented by Ved Prakash of NML in his paper entitled 'Physical metallurgy of aluminium alloys'. The data presented on the effect of thermal cycling on the mechanical properties of welded 6061 aluminium alloys by M. K. Mukherjee, S. Gourishankar and M. Janardanan Nair, Space Science and Technology Centre, Trivandrum, are significant from the point of view of designing satellite shell structures.

An article by C. Sharma and T. Banerjee of NML surveys India's non-ferrous metals resources, estimated requirements, present capacity of production, envisaged expansion of production facilities, and possibility of starting indigenous production of scarcer non-ferrous metals

Although aluminium and its alloys are used largely because of their intrinsically attractive mechanical, chemical or physical properties, there is often a need to better the cost factor, particularly when aluminium is competing with some cheaper materials. The cost of aluminium components can be reduced in a number of ways, for example, (i) by changes in dimensions and weight, while still satisfying the performance requirements; (ii) by more efficient use of the mechanical properties of the existing alloys through refinements of design procedures; (iii) by improved processes of protection; and (iv) by radical changes in the design of a component. These aspects are dealt with in detail by R. T. Parker of the Alcan Research and Development Ltd, UK, in his paper entitled 'Trends in improving economic use of aluminium'. The contribution of aluminium to the development of large scale building construction in France is illustrated in a paper contributed by R. Gauvry, Centre Technique de l'Aluminium, Paris.

The role of aluminium (and its alloys) in engineering industries and and constructional engineering has also been dealt with in detail by other authors.

A significant outcome of the symposium was the proposal for setting up an 'Aluminium Cell' at NML, which would be of great use to the aluminium industry.

Applied X-rays, Electrons and Ions

The first title released under the series 'NPL Monographs on Science and Technology', being published by the National Physical Laboratory (NPL), New Delhi, the monograph is a collection of a series of five lectures delivered by Dr A. Franks at the laboratory during January-February 1969. Dr Franks, a guest worker from the National Physical Laboratory (NPL) Teddington, UK, whose visit

was sponsored by the British Council and the Council of Scientific & Industrial Research, assisted NPL, New Delhi in the development of advanced physical techniques for the analysis and examination of the microstructure of materials and development of a ruling engine for producing spectroscopic gratings.

The first lecture, which bears the title of the monograph and serves as a general introduction to the next four lectures, deals with the work now being done at NPL, Teddington on the production and examination of smooth surfaces. The second lecture, Electron probe X-ray microanalysis and scanning electron microscopy, describes the two powerful techniques for the examination of surfaces. The study of the topography of surfaces and thin films with X-rays forms the subject-matter of the third lecture. Difficulties encountered in topographical studies by electron microscopy are mentioned. The fourth lecture is devoted to the ruling engine, the most precise mechanical device. The difficulties to be surmounted in achieving the required precision and the effects of various types of ruling errors are discussed. The experience gained at NPL, Teddington in the development of the ruling engine to rule gratings for use in the X-ray region of the spectrum has been made use of in designing a new engine (at NPL, New Delhi) which will be capable of ruling larger gratings for optical purposes. The last of the lectures is devoted to X-ray diffraction gratings.

The 110-page (royal 8vo) publication is profusely illustrated with line drawings and half-tones (89 in all). The work described in the lectures formed part of the research programme of the Applied X-rays, and Thin Film Materials Sections of the Division of Inorganic and Metallic Structure of NPL, Teddington.

Second Symposium on Upper Mantle Project

Under the joint auspices of the Geophysics Board of CSIR, the National Geophysical Research Institute (NGRI), Hyderabad, the Indian Geophysical Union and the Geological Society of India and other organizations, the second symposium on 'Upper mantle project' will be held at NGRI, Hyderabad from 28 to 31 Dec. 1970. Papers will be presented and discussed in five technical sessions: (1) Combined geosurveys in selected regions; (2) Regional gravity and magnetic studies; (3) Physics of solid earth (seismology, geomagnetism and geoelectricity); (4) Petrochemistry; and (5) Special problems including heat-flow, paleomagnetism and continental drift.

Those intending to submit papers (research or review) may send short titles and abstracts of the papers by 15 May 1970 and full text of the papers by 1 July 1970. Further details can be had from the conveners Drs S. Balakrishna and M. N. Qureshy of the National Geophysical Research Institute, Hyderabad 7.

PATENTS

ACCEPTED

115127: Improvements in or relating to carbon composition resistances and compositions therefor, T. V. Ramamurti, N. R. Nair & Mohd I. Alam—NPL, New Delhi.

115205: An improved tanning process for upper leathers using chromium and zirconium salts, K. S. Jayaraman, T. S. Ranganathan & D. Ramaswamy—CLRI, Madras.

115272: Magnetic load cell, T. N. Ranganathan, M. P. Viswanathan & V. K. Krishnakutty—CMERI, Durgapur.

115273: A microfilm reader-cum-xerographic printer, M. K. Bermon—Insdoc, New Delhi.

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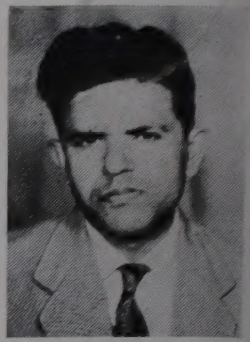
116564: Ultrasonic transducers for automation, sensing and remote control applications, V. N. Bindal—NPL, New Delhi.

Dr Joseph George

Dr Joseph George, Scientist, Central Building Research Institute (CBRI), Roorkee, has been appointed Director, Indian Plywood Industries Research Association, Bangalore. He took over on 23 Jan. 1970. Born in 1921, Dr George had his college education at the Madras University where he obtained his B.A. degree in 1941. He took the M.Sc. degree of the Agra University in 1943.



He joined the Forest Research Institute, Dehra Dun as a research scholar in 1944 and worked on fibre building boards, wood-plastics composite materials and on durability and weathering of wood panel products. During 1944-46 he proceeded to USA on a Government of India scholarship and carried out research at the US Forest Products Laboratory, Madison, Wisconsin on the evaluation of synthetic resins and protein adhesives and the characteristics of wood and wood based materials. He also worked on Friedel-Crafts polymerization at the Polymer Research Institute, Brooklyn, New York.

On his return Dr George rejoined the Forest Research Institute, Dehra Dun as a Research Officer. He joined CBRI, Roorkee in 1962 and was appointed Scientist-Coordinator of the Building Materials Division in 1965. He took his Ph.D. degree from the Agra University in 1964.

Dr George's main field of work is organic building materials. He has made significant contributions in the field of adhesives for plywood, application of wood-based panels in building construction, fire-retardant treatment for plywood and building boards, and panel products from coconut husk and the byproducts of the coir industry and other wood waste materials. He has published over 100 papers in various fields like polymer chemistry, plastics in building, building boards, laminates and sandwich panels, adhesives for wood, paint and surface coatings, and preservation of wood and wood products from termites, fungi and fire.

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